

## E. SANSKRIT.

*Palm-leaf Book, No. 17. Grant'ha Character.*

*Copy of an Inscription on copper of Sadá Siva Mahá rayer.*

Recapitulation of the lunar race, down to YAYATI; of whose line ISVARA RAYEN was born. NARASA RAYEN, TIMMAJI NARASIMMA RAYEN, VIRA NARASIMMA RAYEN, CRISHNA RAYER, ACHYUTA PAYER; the two latter were half brothers, sons of VIRA NARASIMMA RAYER, by different mothers: (here some letters are lost or left out, so that there is no intelligible meaning;) SADASWA RAYEN. In his time the inscription was recorded, Sal. Sac. 1478, in the *Nala* year, in *Margara* month, on Sunday, a new moon day, and eclipse. At which time, peculiarly adapted to religious donations, certain lands and numerous villages were given by the rayer, being then in the shrine of *Vitalesvara Snámi*, on the banks of the *Tungabhadra* river, to *Romanújáchárya* at *Sri Perambúr*, the different villages and lands being in the neighbourhood of that place. The usual sloca at the close is not given, a leaf perhaps being wanting.

*Note.*—It is doubtful whether the donation was to RAMANUJA, in his life time, or to a shrine first established by him; the latter from dates, and attendant circumstances, seems to be most probable.

*Conclusion.*

My report for the three months inclusive from the beginning of October to the end of December, 1837, here finishes. It may perhaps appear, that the abstracts, herein given, offer results of considerable importance. It is however superfluous to add any further observations to those already given, at each step of the investigation.

*Madras, December 31st, 1837.*

II.—*Some account of a visit to the plain of Koh-i-Damán, the mining district of Ghorband, and the pass of Hindu Kúsh, with a few general observations respecting the structure and conformation of the country from the Indus to Kábul. By P. B. LORD, M. B. in Medical Charge of the Kábul Mission.*

[Communicated by the Government of India.]

A parallel of latitude drawn through *Kálábágh*, and west of the Indus would present a remarkable difference in the course of the mountain chains as observed to its north, and south sides. In the latter direction the *Solimán* and *Kála* ranges, the one of which may be looked on as a continuation of the other, generally preserve an almost perfect parallelism with the course of the Indus; while on the other side every range, and they are numerous, from the *Himálaya* and *Hindu Kúsh* to the salt range

inclusive are at right angles with the direction of the stream. In other words the general line of the former is north and south, of the latter east and west. It is of the latter and the country they include that I would at present more particularly speak.

In addition to the general course of the chains thus laid down, there is another fact subordinate yet of no less importance towards determining the physical formation of this part of the country. When the two mountain ranges have for some time preserved their parallel east and west course, the northern is observed to deflect or send off a branch towards the south, while a corresponding deflexion or ramification of the southern chain comes to meet it, and the plain which otherwise would have been one continued expanse from east to west is thus cut into a number of valleys, the longitudinal axis of which however, is still in general to be found in the same direction. If we conceive these valleys to be few, spacious, and well marked towards the north, and south, while in the central or *Kohat* region, they become small, numerous, and crowded so as to resemble a tangled maze, or net work, we shall have a just general conception of that tract of country west of the Indus, which may be familiarly described as lying between *Kábul* and *Kálabágh*.

Unquestionable geological facts, such as the structure of igneous rocks, poured out under strong pressure, the presence of fossil shells, &c. lead me to the belief that several if not all of these valleys were at some former time the receptacles of a series of inland lakes, and the nature of the shells found (principally planorbis and paludinæ), seems to indicate that the waters of these lakes had been fresh. In this manner three grand sheets of water separated by the mountain deflexions before alluded to, would appear to have occupied the entire country from *Kábul* to the Indus, and their basins may now be distinguished as the plains which afford sites to the three cities of *Kábul*, *Jalálabád*, and *Pesháwar*. The drainage of these basins is most tranquilly carried on by the *Kábul* river which runs along the northern edge of each, conveying their united waters to the Indus; but in former times when more energetic means were necessary the mountain barriers burst and the shattered fragments and rolled blocks, that now strew the *Khaiber pass* bear testimony to its once having afforded exit to a mighty rush of waters, while the *Gidergalla* (jackal's neck) or long defile east of the plain of *Pesháwar* clearly points out the further course of the torrent towards the bed of the Indus, whence its passage to the ocean was easy, and natural. While at *Jamrad* I had an opportunity of observing a fact which strongly supports the idea I have ventured to propose for a well which the Sikhs were employed in sinking within their new fort of *Fatteh Garh*,

and which had already proceeded to the depth of 180 feet, had altogether passed through rolled pebbles of slate and limestone, the constituents of the *Khaiber* range of hills. But the wells of *Pesháwar*, generally twenty or thirty feet deep, never passed through any thing but mud and clay strata. Now the fort I have mentioned is situated at the very mouth of the *Khaiber pass*, and *Pesháwar* is twelve or fourteen miles distant towards the other extremity of the plain. If then this plain were once the basin of a lake, into which a stream had poured through the *Khaiber pass*, it is obvious that such a stream would at its very entrance into the lake have deposited the rolled pebbles and heavier matter with which it was charged, while the lighter mud and clay would have floated on to a considerable distance; in other words, the former would have dropped at *Jamrud*, the latter gone on to *Lesnáwar*, and this is precisely the fact\*.

Connected with these three basins and joining that of *Kábul* almost at a right angle from the north, is the plain of *Koh-i-Damun* (the mountain's skirt), which stretches away to the very foot of *Hindu Kúsh*, and gives exit at its northern end to four several routes† by which that chain may be passed. It is an extensive and fertile plain, bounded on all sides by primitive hills, those to the north, east and south, being chiefly of slate including all the gradations from clay to mica, and even at times closely bordering upon gneiss; while the ridge to the west shows the bare granite, and it is at the base and along the windings of this, that occur the vineyards, orchards and gardens of *Shakar-darrá*, *Istalif* and *Isterkhech* so famed in the commentaries of the emperor **BABER**.

The plain is about forty miles in length, with a mean breadth of perhaps sixteen or eighteen. Mountain streams, pouring down from each of the four passes I have mentioned, and bearing their names, unite their waters in its centre, and afford facilities for irrigation which have been by no means neglected; the mulberry, the vine, the walnut, the almond, with peaches, apricots, melons, and fields of cotton, tobacco, rice, wheat, barley, juwari and other grains occur in the richest abundance.

Naturally anxious to visit a place of which we had heard so much, and the praises of which the Afgháns are never tired of reciting, we

\* No mere irruption of water from a mountain lake would have time to grind down masses of rock into boulder, pebble, gravel and sand. These deposits are rather attributed to very long continued action of ocean beaches, or mountain detritus.—ED.

† From a point towards the centre of the plain (*Dush-I-Bogram*) I found the bearings of these four passes as under:—

Panjthar pass, bearing N. Shabel, 15 N. W. Parwan, 25 N. W. Ghorband, 50 N. W.

availed ourselves of the first opportunity afforded by a slight intermission in our business and started from *Kábul* about the middle of October; Lieutenant LEECH, and myself having the further intention of proceeding to the top of *Hindu Kúsh*, he for the purpose of reconnoitring the pass, and I to pick up any stones, plants, or animals that might occur in the way.

Our first day's march was sufficiently barren, being chiefly occupied in passing over the low slaty ridge which separates the valley of *Kábul* from that to which we were proceeding, but on the second morning having gained the entrance of *Shakar-darrá*, our entire road was one succession of gardens. The trees had already put on their beautiful autumnal tint. The mountains exhibited the grandest varieties of light and shade. Clouds still lingered amongst their inequalities and rested here on a speedy cliff, there on a lengthened streak of snow which, deep in a ravine, had resisted the whole force of the summer's sun. The dead nettle, the thistle, the dog-rose covered with hips, the may with its glistening hair berries, the wild mint, fennel, lavender, and a thousand other well known plants perfumed the air or recalled our recollections to our native land. The morning was calm, grey and autumnal. We were filled with a tranquil pleasure.

Our tents were pitched at the entrance of the *Bágh-i-Sháh*, a garden planted by SHÁH TAIMUR. We entered and found it spacious and beautiful though in decay, many of the loftiest poplars (*Chinars\**) had lately been cut down by orders of MUHAMMAD ABKAR KHÁN, but so great was the abundance of shade, that their fall would scarcely have been noticed had they not lain in our path. At the farther end was an ascent which we climbed and from which the most glorious prospect of vale and hill, sunshine and shade, mountain and rivulet, garden and woodland, burst on our view. There had formerly been a garden house on this spot, and beneath we could perceive where the water dammed in had formed a lake, but the dam was destroyed, the lake was gone; a decayed tree had fallen across the bed of the rill which had formerly supplied it, and its waters diverted from their course had spread themselves over the adjacent flats, and converted them into plashy swamps.

It struck us as not a little singular that amidst so great a profusion of vegetation animal life seemed all but totally extinct. A few magpies, sparrows and pigeons with an occasional chikor (*Tetrao rufus*) were the sole representations of the winged tribes, as were a small lizard, and a frog, of the reptiles. The greater number we were told had emigrated for the winter towards the warmer regions of *Jalá-*

\* *Platanus Orientalis*.

*labád* and *Pesháwar*, and even some as the *Kalang* or Indian crane to the plains of Hindustan. The thermometer in our tents at this time ranged between 45° and 65° Fahr.

We lingered for three days amongst those delicious vales, passing slowly through *Shakar-darra*, *Ká-darra* and so on to *Istalif*, but the snow began to fall rapidly on the higher hills, and it became evident that our attempt on *Hindu Kúsh*, must be made immediately or relinquished for the season. Without further delay, therefore we left the skirts of the hills and marched to *Charikar*, a flourishing town towards the northern extremity of the plain, where a few hours sufficed to make the necessary preparations for our excursion.

The entrance of the *Ghorband pass* by which we meant to penetrate was but four or five miles in a northwest direction from the town, but though the foot of the mountains was thus near, the road through them was no less than fifty miles in length before it led us to the top of the pass over *Hindu Kúsh*, by which the great caravans from Tartary or *Turkistin* annually arrive in *Kábul*. As the *Uzbeks* at the other side of the pass are notorious slave-dealers, secrecy and dispatch were alike advisable; accordingly on the morning of the 18th October, equipped as Afghan horsemen and accompanied by four mounted attendants, and a guide to whom alone we had entrusted our plans, we marched from *Charikar* and halting an hour at noon to rest the horses, succeeded by sunset in reaching *Sherikai* the last inhabited spot at this side of the pass, from which however it was still distant eighteen miles. In the course of this day's journey we had first come on micaceous schist, dipping to the N. W. at an angle of about 45°, which soon however increased until the strata became perfectly vertical. Gneiss then succeeded, but soon gave way and the mica slate again came up graduating insensibly into black slate, intersected by numerous thin veins of quartz, and presenting in the neighbourhood of *Sukht-i-chenar* a large, valuable though unwrought, iron mine, of the kind usually denominated red sparry iron ore! This gradulation of the micaceous into clay slate is well shown in some of the specimens I was enabled to collect, and which with specimens of the different ores mentioned I hope when an opportunity presents to have the honor of forwarding. In the mica slate immediately over the entrance of the pass, and on the very summit of the hill, occurs a vein of silver ore which however appeared to me so poor that it would scarce pay the expense of working. I heard of a much richer vein in the pass of *Panjabir*, which was said to have been worked to a great extent in the time of the *Bhagatais*, but this I had not one opportunity of seeing: during the

march granite once or twice made its appearance, shooting up abruptly through the slate. It was of a large open grain approaching nearly the species termed graphic. Wherever the valleys opened advantage had been taken of it for the purposes of cultivation, and we passed several little green spots, containing mulberries, walnuts, fields of barley, and a dwarf cotton, which, though in pod, did not exceed six or eight inches in height. Next day the formation was extremely simple and well defined. At first we had a mica slate in strata running nearly east and west, and dipping at an angle of  $75^\circ$  a little to the west of north. To this succeeded gneiss in irregular blocks, with contorted laminæ gradually changing into regular strata, the dip of which (in the same direction as that of the mica slate), increased until they became perfectly vertical, and then came up the granite, forming the last six miles of the ascent, and shooting up above the pass in such precipitous peaks that the snow which lay thick round their base could find no resting place along the sides.

The road had risen so gradually that it was not until within 12 or 15 miles of the summit that we found the ascent becoming so rapid as to cause the stream which occupied the bottom of the valley to cascade, nor did we ourselves experience any considerable difficulty until we had arrived within a mile of the pass. It then became very steep, and in consequence of a partial thaw of the snow, very slippery and dangerous. The horses fell and appeared much distressed. We were obliged to dismount and proceed on foot, and in so doing we met the goods of a Kafila which had reached the opposite side of the pass, but in consequence of its slippery state had been unable to proceed. A fresh supply of beasts of burden had been collected on this (the south) side, and were waiting below while the goods were being transported over the summit on men's shoulders. As this was on the 19th October it will serve to give a fair idea of the early period at which this pass becomes impracticable. We learned from the persons employed in collecting toll that in ten days more at furthest it would be finally closed by the snow, after which time no Kafila could venture. The reports of the natives had informed us the persons ascending this pass were frequently seized with giddiness, faintness, vomiting, and the other symptoms usually described as occurring at considerable elevations, and though we ourselves experienced nothing of the kind, yet we see no reason to doubt the general correctness of the story, as we estimated the total height of the pass as little inferior to that of Mount Blanc. This is a point we regret exceedingly we had not the means of determining in any precise mode. A thermometer which we had brought with the intention of ascertaining the boiling point of water on the summit was unfortunately

broken on our first day's march, and a barometer was too cumbrous and ostensible an object for persons wishing to avoid observation. However from calculations made by Lieut. LEECH (to whose survey I refer for all topographical details), respecting the rates of ascent at portions of the road, we felt inclined to conclude that the total height could not be less than 15,000 feet, and comparisons which I have subsequently been able to make with other passes in the same range, the height of which I ascertained, afford me assurance that this is by no means an over-estimate.

We searched in vain on the top for the *Kirm i barf* or snow-worm, the existence of which is confidentially affirmed by the natives who accounted for our want of success by saying that fresh snow had fallen, and that the worm was only to be found on that of last year. In that case its existence at least on this pass must be extremely limited, as it would be hard to name a month in which snow does not or may not fall here.

At the time of our visit the snow, which on the southern face extended in any quantity to a distance of not more than four or five miles, on the northern, reached eighteen or twenty; and at a subsequent period, November 9th, when I made an attempt to go into *Turkistán* by the pass of *Sir-Alang*\*, and met with no snow until within ten miles of the summit, it actually on the northern face extended 60 miles or nearly four days' journey. This is a fact which forcibly arrested my attention as the reverse is well known to be the case, in the *Himálaya* chain where snow lies lower down on the southern face than on the northern, to an extent corresponding with 4000 perpendicular descent. But the *Himálaya* and the *Hindu Kúsh* have the same aspect, the same general direction, lie nearly in the same latitude, and in fact are little other than integral parts of the same chain. The local circumstances however connected with each are precisely reversed. The *Himálaya* has to the north the elevated steppes of central Asia, and to the south the long low plains of Hindustan. *Hindu Kúsh*, on the other hand, has to the south the elevated plains of *Kábul* and *Koh-i-Dáman* between five or six thousand feet above the level of the sea, while to the north stretch away the depressed, sunken and swampy flats of *Turkistán*; *Balkh*, according to Captain BURNES, being only 1800 feet, while *Kunduz* at which I am now writing is by the boiling of the water† not quite 500 above the surface of the ocean.

\* The upper district in the *Parván* valley is called *Alang*; the mountain pass over it *Sir-Alang*; *Sir* simply meaning head or top.—MR. ELPHINSTONE writes it *Sauleh Oolong*.

† The mean of three thermometers which had been carefully boiled and registered at the sea level.

I should mention, that since commencing this report I have been agreeably interrupted by an invitation in my professional capacity, to the court of MEER MINAD BEY, the chief of *Kunduz*, in accepting which, anxious to explore a new route, I first in company with Lieut. WOOD, N. I. attempted the valley of *Parwán* and pass of *Sir-Alang*, but being repelled by the depth of snow and a violent storm which came on just as we had reached the summit, we were obliged to return and go by the road of *Bámian*. In this way I have been enabled considerably to extend my acquaintance with the chain of *Hindu Kúsh*, and shall therefore venture one or two observations further respecting it. A core of granite, and resting on it a deep bed of slate, are the prominent features in its structure. The direction of those as well as of the chain itself is generally from east to west, and as a consequence of this its largest and most open valleys will naturally lie in the same direction, while the steepest ascents will be met with in proceeding from south to north. This *à-priori* induction is perfectly confirmed by my experience. The pass of *Sir-Alang* and the pass, as it is called par excellence, of *Hindu Kúsh*, are both met in an attempt to proceed north, and the roads leading to each are for wheeled carriages perfectly impassable, while the vale of *Ghorband*, which runs east and west through the heart of the mountains for thirty or forty miles, would admit of a coach being drawn the greater part of the way; and the *Bámian* road, which has in every part been traversed by heavy guns, is so nearly in the same direction that *Hajighát*, the point at which it turns the extremity of *Hindu Kúsh*, though 80 miles in a direct line from *Kábul*, is according to Lieut. WOOD's observations, but ten miles north of the latitude of that city\*.

The granite that forms the summit of the entire ridge is from the pure whiteness of the felspar and the glossy blackness of the hornblende of a very beautiful appearance. A peculiarity was observable in its structure where we first reached it, which I do not remember to have seen before. The hornblende had become so collected in patches through the rock that the whole looked as though it were a conglomerate containing dark-colored pebbles of a previous formation, nor was it without a closer examination that I was able to satisfy myself as to the real nature of the fact. These concretions were always of a spheroidal form, varying in size from a diameter of two or three inches to a foot and upwards, and evidently possessed of superior powers of resistance; for in cases where the mass of the rock had suffered from wea-

\* See Lieut. WOOD's survey for this and all other topographical details alluded to on the *Bámian* and *Sir-Alang* roads.



thering or been fractured by some external force, these were frequently seen uninjured and protruding in rounded nodules beyond the general surface. A similar fact, if I mistake not, has been noted by M. BRONGNIART as occurring in a granite of Corsica, and taken in connection with HALL's experiments on the fusion and subsequent refrigeration of basalt, it forms a most interesting link in the chain of evidence which goes to connect granite with rocks of undoubted igneous origin. This same peculiarity of mineralogical structure was again remarked by me when I came on what I thence conclude to be part of the same outbreak of granite (though at a somewhat diminished elevation), between *Agrabad* and *Saighan* on the road north of *Bámian*, and it is not a little remarkable that it was here accompanied by an almost basaltic arrangement of the rock. This is so evident that Captain BURNES in his former journey, viewing it merely with the eye of a traveller says, "Cliffs of granite blackened by the elements rose up in dusky but majestic columns *not unlike basalt.*" Next to the granite lies the great slate formation I have mentioned, and which must be considered as including gneiss, mica and clay-slate of numerous varieties, with chlorite and other subordinate slates, as well as veins of carbonate of lime and quartz, the latter sometimes attaining a thickness of two or three hundred yards, though more frequently from a few inches to two or three or four feet. Of all these the gneiss appears to occupy the inferior position though this is by no means constant, on the contrary every possible alteration may be found amongst them. The formation is of very great extent reaching in length from *Attok*, where we first came on it, in the form of black roofing slate, to the longitude of *Bámian*, 100 miles west of *Kábul*. It probably extends much farther, but I speak only of what I have seen.

Its mean breadth may be safely stated at between twenty and thirty miles, at least three perfect sections which I have made of it were all fully of that extent. It runs in the first instance north of the basin of *Pesháwar*, hard, blue, non-fossiliferous limestone\*, which we had traced upon it from *Hasan Abdul*, parting from it at the *Gidergalla*, and going round to form the southern edge. It is then continued north of the basins of *Jalálabád* and *Kábul*, sending down the two southerly deflexions or outlying ridges which mark their ancient margins, and which we traversed by the *Khaibar* pass, and that which leads through *Tiyen* to *Balkh*, distances of thirty and twenty-five miles respectively. A smaller slaty ridge separates *Kábul* from the plain of

\* The same Dr. FALCONER informed me, which from its being so generally found along the base of the *Himálaya* chain, is usually termed sub-*Himálayan*.

*Koh-i-Dáman*, and when you have arrived at the summit of this and attempt to go north you again meet with this same slaty belt of thirty miles in thickness, which must be traversed before you reach the granite core of *Hindu Kúsh*. In short to attempt a generalization more extensive perhaps than I am strictly warranted in offering, though derived from many sections in various directions, I would say, that an observer in passing south, from the top of *Hindu Kúsh*, to the parallel of *Kátabágh*, would see first a core of granite with coating of slate, as in the grand mountain chain; next a core of slate with a coating of limestone as at *Attok* and *Khairabád*; then ancient hills of limestone, hard, blue, and non-fossiliferous, as in the ridge between *Pesháwar* and *Kohat*; then a core of more modern limestone (fossiliferous) with a coating of new red sandstone as in the hills south of *Kohat*, and then would find himself amongst aluminous clay, sulphur, gypsum, bituminous shale and rock-salt which occur near *Lachi*, *Ismáel Khail* and *Teri*, and are thence continued south to the parallel I have mentioned terminating the groupe.

Respecting the slate I shall only add that north of the *Kúsh* it appeared to be by no means of the same extent or importance. After passing the granite I have mentioned at *Saighan*, I again came on it; but it did not exceed four or five miles in breadth, and its place seemed occupied by silicious sandstone and fossiliferous sandstones which here are of immense depth; as however I have rather turned than crossed the ridge in my way to *Turkistán*, I have not examined it at each side and under similar circumstances.

Subordinate to the slate formation, limestone both primitive and secondary occurs. The former in vast cliffs overhangs the upper part of the valley of *Parwán*, and exhibits numerous and large natural cavities, in one of which the water of the valley is engulfed and does not re-appear for a distance of two miles. The general color of the limestone here is of a light gray and striped, but masses of it which have fallen from above and lie in the water-course are often of a dazzling whiteness. I cannot say I met with any of this same formation in my way up to the pass of *Hindu Kúsh*, but an extensive limestone formation which I shall have occasion to notice again, is to be found in the *Ghorband* valley and affords a matrix in which occur ores of antimony, iron, and lead. Still further west on the *Bámán* road near *Jubrez*, I again met with this same limestone, grey and crystalline, in vertical strata, and running east and west, and I learned that immediately to our south in the hills round *Midan* it affords quarries of white marble, which it was further said might be had along the back of the whole range west to *Herát* and south to *Kandahár*. At the former of these places it has been worked

from time immemorial, but at *Kábul* its existence was unknown until the days of the emperor *SHAH JEHÁN\**, to whom it was disclosed by a *Heráti* stone-cutter, when he was occupied in the pious task of erecting a mausoleum to his great progenitor *BABER*. The marble for the mosque and tomb of this structure which still exists, though sorely frayed by time, was brought at immense expense from *Delhi*; but the marble pavement, as well as the materials for the enclosure that surrounds the whole, were in consequence of the *Heráti's* suggestion derived from the quarries of *Midan*. The marble is not equal to that of *Delhi*, but still has a pure color, an open crystalline texture, and is commended by the workmen as yielding readily to the chisel. From the unskilfulness of the workmen employed in raising it, large slabs are with difficulty procured, and in consequence the price is high, four rupees being charged for a slab, a guz† square, in its rough state at the quarry.

In this part of its course (near *Jubrez*), the limestone alternates with mica and clay-slate, and a stratum of it again occurs a few miles further,—one at *Sir-cheshmeh*. It is not more than a mile or a mile and a half in breadth; but it suffices to give birth to the beautiful and abundant spring from which the place derives its name (*Sir-i-cheshmeh*—literally, fountain's head), and which forms the true source of the *Kábul* river. Twenty miles further on, between *Gardan-i-Dewan* and *Gulgahni*, limestone once more appeared in the form of a very thin vein, about 150 feet in breadth, perfectly conformable with the strata of slate which enclosed it: and here again it threw up a spring which, however unlike the former, was deeply impregnated with iron saline matter, and abundance of carbonic acid gas, that caused the whole to effervesce as though it were boiling. This spring has many medical virtues attributed to it by the natives, and is extensively used as a tonic, particularly for impaired powers of digestion, to which I have no doubt it proves serviceable. Its temperature was 51° Fahr. which probably is somewhat below its natural standard, inasmuch as it was surrounded at the time of observation with melting snow. The temperature of the well of *Sir-chashmeh*, nearly in the same parallel of latitude, I had ascertained two days before to be 54° 5', and another well also from limestone near *Agrabád*, half a degree further north, I found to be 54°.

I would here remark that the temperature of wells, as generally taken without reference to the formation in which they occur, must needs be a most imperfect, indeed erroneous, method of approximating

\* My informant said *HUMAIYUN*, but as the inscription on the tomb shews it to have been erected by *SHAH JEHAN*, I have transferred the story to him.

† About three feet English.

to the mean temperature of the place, inasmuch as different rock formations, like different metals, vary much in their power of conducting heat. Thus, a well at *Pesháwar* gave me a temperature of  $64^{\circ}$ , while one at *Attok*, almost under the same parallel of latitude and at the same altitude above the sea, was as high as  $78^{\circ}$ , the thermometer at sunrise in each case standing about  $80^{\circ}$ . But the well at *Pesháwar* was in loose clay, mixed with vegetable mould, a notoriously bad conductor of heat, while that at *Attok* was in hard black slate, which would thus appear to have a very different quality. Again a well at *Agrabad* in limestone, latitude  $35^{\circ}$  north, shewed a temperature of  $54^{\circ}$  Fahr. while another in slate a few miles further north, stood at  $48^{\circ}$ , the altitude of both being nearly equal, and the thermometer at sunrise below the freezing point; so that in this instance also, the slate would appear to have had superior powers of conduction. To pursue this, however, would lead me too far from my present subject, besides it is time I should come down from the top of the mountain, which we did, though not until we had gratified our curiosity with many a longing glance down the snow-clad vale that led towards *Turkistán*, and indulged our loyalty in a libation to the health of our youthful queen as the first of her majesty's subjects, indeed we may add of Europeans, who had succeeded in surmounting this celebrated range.

We now turned our attention towards the vale of *Ghorband*, the opening of which, distant about 14 miles from the plain, we had noticed in our upward course, threading off to the south of west so as to stand nearly at a right angle with the pass we had travelled, the general lie of which was a little to the west of north. And nothing could be more striking than the difference between the two valleys. The one narrow, rocky, and uneven, with an average fall of 200 feet per mile, so that it was impossible it should even have contained any other waters than those of a rapid headlong torrent, while the other, that which we now entered was wide, level, and fertile. The primitive rocks had retired to a distance of from one to three miles, and within them was deposited a secondary row of small rounded hills consisting of conglomerate pebbles and clay, and horizontal strata of fine mud, such as could only have been collected during a long series of years from the tranquil waters of a scarcely moving lake. Along such a formation we travelled for about 15 miles, the hills I have described generally lying to the south of the road, while the *Ghorband* river, of a respectable breadth and not in all places fordable, run close along the edge of the slate which descended in steep cliffs on our north. But on reaching *Sujagarh*, the hitherto uniform tints of the mountain were seen to be varie-

gated with red, green, and ashen grey, which on examination we found to be produced by ochre, red, indurated clay, decaying green stone and strata of volcanic ashes. These indications of ancient volcanic action, and along with them, efflorescence and sheets of sulphate of lime, the deposits of springs which had whitened large tracts on the side of the range, extended along westward, as we continued our course to *Chandi*,—the volcanic indications being generally at an inconsiderate elevation, and in most instances capped by conglomerate or beds of clay to a depth of 50-200 feet. The valley we were told, stretched away west and southwest, until it nearly reached to *Bámian*; but the upper end of it was inhabited by the *Shaik Ali*, a lawless tribe of *Huzarabs* who acknowledge no ruler, and rob every one that comes within their grasp, so that for a long series of years, the road has been closed to the traveller and the merchant.

We were therefore obliged to terminate our researches at *Chandi*, but it gave me no little pleasure, on a subsequent journey, to recognize the very same volcanic indication with basalt, and anzodaloid superadded, in the vale of *Lohuk*, which is distant about 40 miles southwest of the point where we were now turned back, and to be able to trace these indications through *Topchie* up to *Bámian* itself, and finally to identify by its mineralogical characters, as well as by its geological connections, the conglomerate in which the caves of *Bámian* are scooped, and its gigantic idols carved, with the conglomerate in the vale of *Ghorband*, in which we now proceeded to examine a more extensive and more useful excavation. This was a lead mine which had been worked in the time of the Chagatais, but which, from the ignorance of the Afghans or the troubles which have so constantly beset them, has been totally neglected, insomuch that the inhabitants of the neighbourhood were perfectly unaware of its nature, and viewed it with a sort of superstitious reverence, as a relic of some mysterious folk of former times. They even made some difficulties about shewing us the entrance, and when they understood our intention of going in, earnestly attempted to dissuade us; a few agreed to accompany us as torch-bearers, though the greater part shook their heads at their rashness. Having obtained a good supply of oil, and taken a compass that we might be sure of our way back again, we commenced our under-ground exploration at the auspicious hour of noon, on the 22nd October, 1837.

The mine is known by the name of *Feringal*\*, is situated at the

\* In an ingenious paper on the site of Alexandria ad Caucasum, I observe Mr. MASSON wishes to appropriate this as the cave of PROMETHEUS. I am sorry to deprive him of it, especially for so ignoble a purpose as to convert it into a lead

upper part of the district of *Churdé*, about thirty miles from the entrance of the valley of *Ghorband*, and on the side of a hill facing the east, at an elevation of about 250 feet above its base. The hill is composed beneath of quartz rocks, above conglomerate, and between both is a thin, schistose layer, which, as well as the quartz, appears to dip away rapidly to the west. The excavation is entirely made through the conglomerate, and descends to the depth of one hundred feet perpendicular before it reaches the ore, which is a galena or sulphuret of lead extremely rich and valuable. The galleries have been run and shafts sunk, with a degree of skill that does no little credit to the engineering knowledge of the age; but I am yet at a loss to understand what could have induced them to sink a mine on the spot they have chosen, as there is not the slightest external indication that I could perceive of the presence of mineral in the hill; nor was it until they had mined to 100 feet perpendicular descent and an actual distance of more than half an English mile that they came on the ore. Perhaps had I been able to get to the back of the hill I might have found the mineral cropping out there, still if that was the case, why was the excavation not made at that side? One thing is evident that the works were commenced on knowledge and principle, not on blind chance; for on arriving at chamber No. 1, a regular shaft, two feet square, and eleven feet deep had been sunk, and not finding the ore, they continued their gallery about forty yards, further to chamber No. 2, where the ore actually exists. Now at a first attempt (for there was no previous shaft sunk), to reach so very near their object as six or eight feet, which was the total difference in level between the bottom of the shaft and chamber No. 2, shewed an acquaintance with the lie of the mineral and the level at which they had arrived that could scarcely be exceeded in the present day. By the kindness of my friend and fellow-traveller, Lieut LEECH, I am enabled to annex a plan of the works and view of one of the chambers, which will at once afford a clear explanation of the whole, and save the necessity of entering into further details\*.

The galleries were in some places so low that we were obliged to crawl on all fours, and this, added to the heat and smoke of the torches and the quantities of dust which we knocked in our progress, rendered our task not a little fatiguing, and at times almost threatened us with suffocation. The dryness of the mine was so perfect that putrefaction mines, but *eu revanche*, I can offer him the cave of TALAGUD, (mentioned in a subsequent part of this paper,) which being a natural excavation will probably suit him better. Major WILFORD is for having the cave of PROMETHEUS at *Auk-Serai*, to which I know of but one objection, that there is no cave there.

\* This will be forwarded hereafter, not having come to hand.

seemed almost at a stand still. One of the human skulls which we found, had the scalp and hair attached to it, in a good state of preservation, and a porcupine which lay at the bottom of the shaft, though evidently long dead, was almost entire.

The only living animal in the excavation was a bat, (*Rhinolophus*), which I have preserved; but the quills and other spoils of porcupines, with a great heap of their dung shewed this to have been a favorite resting place with them for many generations. The remains of oxen and sheep which occurred, had probably been taken down for the purpose of feeding its human inhabitants in former times, and this was rendered still more likely, from the circumstance of the horns having been sawn off the heads of the rams; such a practice obtaining even to the present day, the object being to place on some rustic shrine (*zearut*), to which they are considered an appropriate offering. Half-burnt blocks of timber were in some of the large chambers, but we did not succeed in finding tools of any sort.

From the number of galleries we had to examine on our passage downward, before ascertaining the right road, we were more than two hours in reaching the one, but our return only occupied 20 minutes. We did not reach the extreme limit of the excavation, as the fear of our oil being exhausted compelled us to limit our researches. The total time we remained under ground was a little short of 3 hours. We returned to the external world at 5 minutes before 3 of P. M. and found nearly the whole population of the neighbourhood assembled to witness our resurrection. We retraced our steps the same evening to *Kinchak*, immediately at the back of which is a mountain, from which antimony is procured in abundance. The formation is black slate, and the ore is on the surface, so that it requires no further description.

*Murdar sungan*, ore of lead, I have not ascertained of what nature, and my specimens are at *Kábul* while I am writing at *Kunduz*, occurred in the valley under *Kinchak*, and was also to be found on our way to *Hindu Kúsh*, under the village of *Kúshim*. The ore is crystallized, and is generally picked up in lumps at the bottom of the valley, being distinguished as I was told, by its property of drying with great rapidity, so that the usual time of gathering it is after a shower of rain when all the other stones are wet. The mine of it is not known, but certainly must be very near, as these lumps are got in great abundance, and are said by the natives to be brought down by the stream, the source of which is, at most, but 3 or 4 miles distant.

At *Kinchak* and generally through this district, the slate was found reposing on quartz rock, which in other parts of the range seldom ap-

peared. The slate was in many places black and crumbling, (a variety described by MACCULLACK,) and looked as if altered by fire.

In a limestone hill, west of *Fuligird*, occurs another mine of antimony like the former on the surface, and on our way to visit this, we unexpectedly hit on a very magnificent natural cavern, which we explored (having sent back for torches), to the distance of three or four hundred yards; but without finding bones or indeed any thing to reward us, except the sight of some very large and transparent stalactites. The cavern was situated almost on the summit of the hill, 2000 feet above the *Ghorband* valley, which with its river now lessened to a silver thread, and its gardens of apricots, mulberries, and almonds, in their autumnal livery, looking as though they had been painted on the lofty and perfectly barren mountains, which every where towered above them, had a singularly beautiful and almost magical appearance.

This hill is based on quartz rock, between which and its limestone cap intervenes a bed of decaying mica slate about 500 feet in thickness. This has a gentle dip ( $10^\circ$ ) towards the southwest, and the limestone, which is grey, and crystalline, lies conformably on it. The mouth of the cavern is marked by a wild almond tree which grows over it, and seems to spring from the bare rock. There is a second opening about 100 feet lower down, but the rock is so precipitous that this can only be approached through the cavern. Iron ore occurs so abundantly through the entire range that I have thought it unnecessary to particularize its localities. The richest I have seen is the black iron ore near the *pass* of *Hajeeghuk*, where it forms entire hills by itself; but from the difficulty of carriage and total want of fuel its value must be considerably diminished.

Copper is not to be found in the parts which I have visited, all the specimens brought to me were from the neighbourhood of *Bajour* north of *Pesháwar*. They were principally malachite and peacock ore, and seemed rich in metal.

I heard of the existence of lapis lazuli in the vicinity of *Fuligard*, and sent a man to search for it in the direction indicated, but he returned unsuccessful.

Zinc in the form of its effloresced white sulphate, known here by the name of *zák*, occurs generally through the volcanic region I have described, as do also sulphur, sal-ammoniac, ochre, and nitre. There is a salt spring at *Nimakan*, which lies between *Ghorband* and *Kairshana*; but salt for domestic purposes is generally brought from near *Balkh*.

The influence of petrifying springs has been extensive in this district; some of them are still at work, others closed up by their own deposits.



In the neighbourhood of *Lohuk* they were particularly abundant, and in one place, the beds cut through by a torrent shewed a thickness of 50 feet, the individual layers not exceeding 1 to 3 inches.

On our way back through the plain of *Koh-i-Dáman* we paid a visit to *Reg-rowan* (the flowing sand), which has long been an object of wonder, and veneration to the natives. It is simply a bed of loose sand on the slope of a hill, which if set in motion by any cause, as by the wind or by a man, rolling down from the top, produces lengthened sonorous vibrations not unlike those of the string of a bass-viol. The fact is mentioned by *BABER* who compares the noise to that of drums or nagarehs, and a corresponding fact has been noticed as occurring at *Jubbul Tor* on the shore of the Red Sea. On my way into *Kábul* I noticed two other similar though smaller collections of sand on projecting hills, and in all cases these projections faced the south. The sand is such as would proceed from the disintegration of granite consisting chiefly of quartz and hornblende, but there is no rock of the kind nearer than the opposite side of the plain. A west or southwest wind would certainly have no difficulty in transporting it this distance, and if so brought it would naturally collect on the projections I have mentioned, which are at right angles with the general lie of the hill-range here, and form so many rocks or corners. I am hardly as yet justified in making any inference respecting the frequency of such winds, but I may state the simple fact that on referring to my register for the 20 days, I spent in *Kábul*, September 20th to October 10th, I find that during 14 days of them, these winds prevailed.

We returned over the *Dusht i Baghrám* which antiquarians seem to have fixed on as the site of Alexandria ad Caucasum. The number of coins found here principally Grecian and Cufic, is immense. Mr. *MASSON* last year procured no less than 35,000; and during a halt of a few hours, two children employed by Lieutenant *WOOD* picked up from 20 to 30.

On my arrival at *Kábul* I had the gratification to find a message awaiting me from *SHEER MUHAMMAD MINAD BEY*, requesting my professional attendance on his brother who has long suffered from an eye complaint.

The consequence is that I am now with Captain *BURNES*' permission passing the winter in *Kunduz*, while Lieutenant *WOOD*, who accompanied me, is on his way to investigate the source of the *Oxus*.